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ABSTRACT

This unit of instruction on selection and living styles for energy conservation in single-family and multi-family housing and mobile homes was designed for use by home economics teachers in Florida high schools and by home economics extension agents as they work with their clientele. It is one of a series of 11 instructional units (see note) written to help teachers and agents to educate their students and clients about the problems of energy shortages and strategies for energy conservation and management. This instructional unit is organized in three modules: (1) Single Family Homes; (2) Multi-Family Homes; and (3) Mobile Homes. Topics covered include factors to consider in building, remodeling, or purchasing a single family home with regard to energy conservation; energy-related factors to consider in choosing an apartment; energy-related factors to consider in choosing the location for a mobile home; and improving the energy efficiency of a mobile home. The unit contains student performance objectives, content information, teaching-learning activities, student handouts, transparency masters, and evaluation instruments. (KC)

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LOW ENERGY TECHNOLOGY
A UNIT OF INSTRUCTION
IN
HOUSING AND HOME ENVIRONMENT
SINGLE FAMILY HOMES - MULTI-FAMILY HOMES - MOBILE HOMES

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Developed by

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Department of Agricultural and Extension Education
Department of Home Economics
Institute of Food and Agricultural Sciences
University of Florida
Gainesville

1980

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This unit of instruction was developed as a part of the Low Energy Technology Program of the Institute of Food and Agricultural Sciences, University of Florida. Additional copies of this and other units of instruction in Low Energy Technology can be obtained by contacting the Instructional Materials Service, 101 Rolfs Hall, University of Florida, Gainesville, Florida 32611.

CE 030 822

INTRODUCTION

Energy considerations will play a greater role in a family's decision when selecting a new home, whether it be a single unit, multi-family unit or mobile home. Energy prices must be considered as a necessary expenditure along with house payments.

In order to fight rising energy prices in the housing industry, potential home-owners must be able to recognize and select the various energy efficient options that will be compatible to their desired lifestyles. Some options will depend on the particular unit selected, such as choosing a middle apartment to gain extra insulation from surrounding apartments. Other options to be considered include orientation of the building, location of shade trees, and window overhangs, to name a few. However, the residential owner should be made aware of the many trade offs involved in their selections and how to learn to work with natural forces rather than against them.

This unit of instruction on Housing and Home Environment has been organized into three modules: Single Family Homes; Multi-Family Homes; and Mobile Homes. Each module contains student performance objectives. After the completion of these modules, the student will be able to:

Single Family Homes - Module 1

1. When planning to build, remodel, or purchase a single family home; analyze the location and orientation of the house for efficiency by listing and defining four factors of consideration.

2. When planning to build, remodel, or purchase a single family home; analyze the construction features of the house for energy efficiency by listing and defining ten factors to consider.

Multi-Family Homes - Module 2

1. List four energy related factors to consider in choosing an apartment or other multi-family unit.

2. Assume the tenants of an apartment building paid all utility bills except for central heat and air conditioning (these costs are included in the rental price). List five methods you would expect tenants to use to save energy.

3. Now assume that the tenants pay all utilities, including heat and air conditioning. Now list the five methods you would expect tenants to use to save energy.

Mobile Homes - Module 3

1. List four energy related factors to consider in choosing the location for a mobile home.

2. List three methods for improving the energy efficiency of a mobile home.

This unit of instruction includes student performance objectives, content information, teaching-learning activities, student handouts, transparency masters and evaluation instruments. Use a copy machine to reproduce the student handouts and make the transparencies.

This unit of instruction was designed for use by home economics teachers in Florida high schools and by extension home economics agents as they work with youth and adults. It would be appropriate for use by any professional home economist as they work with their clients. This unit of instruction was developed by the Department of Agricultural and Extension Education and Department of Home Economics, Institute of Food and Agricultural Sciences as part of the Low Energy Technology Program.

UNIT: HOUSING

LOW ENERGY TECHNOLOGY
HOUSING AND HOME ENVIRONMENT

MODULE: SINGLE FAMILY HOMES

STUDENT PERFORMANCE OBJECTIVES	CONTENT	TEACHING-LEARNING ACTIVITIES
The student will be able to:		
1. When planning to build, remodel or purchase a single family home, analyze the location and orientation of the house for energy efficiency by listing and defining four factors to consider.	Orientation and location: Factors to consider; - Main (long) side, front should face south, the most difficult orientation to address is western exposure; over hangs will not shade the sun in the summer, so there is excessive heat gain. - Limit window area to 10-15 percent. - Raise the height of window sills. - Use roof overhangs, porches, carports, balconies, awnings, shade trees to shade. - Shape of house, square or rectangular shapes better than L, T, H shaped houses. Less exterior walls. - Locate air conditioning condenser in a shaded area, preferably the north side of the house. - House protected from prevailing winds.	Read: "Building or Remodeling to Save Energy". Show transparency: "How an Overhang Shades A Window". Show transparency: "Shape of Home Reflects Energy Use". Cut from opaque paper shapes of 2" x 4" and 2" x 2" and on other half of transparency lay out other shaped houses of 1600 square feet. Calculate feet of exterior wall. Locate five houses, near school and preferably on corner lots. Have students observe these houses from the street or sidewalk and complete the handout: "Location and Orientation of Houses". Discuss results in class. You may want the students to include their home as one of the houses.
2. When planning to build, remodel or purchase a single family home, analyze the construction features of the house for energy efficiency by listing and defining ten factors to consider.	Construction factors to consider: Location, shape and size of windows Type, installation and weatherstripping of windows. Double glazed or insulated glass Reflective coated glass	Read: "Building or Remodeling to Save Energy" and "Heating and Cooling with Less Energy".

STUDENT PERFORMANCE OBJECTIVES	CONTENT	TEACHING-LEARNING ACTIVITIES
	Location, fit and insulation quality of doors Overhangs and other construction features to provide shade Insulation of walls, ceiling and floors to meet recommended R-values Ability to shut off areas of the house which may not need to be heated-cooled at all times. Why cool bedrooms during the day? Lighting, natural vs. artificial; flourescent vs. incandescent lighting Electrical appliances with high Energy Efficiency Ratios (EER), proper size Ventilation of attic spaces Natural ventilation of living space Control of humidity Energy efficient heating system, proper size Location and size of water heater near major use areas	Show slide-tape sets: "Stop Thief" and/or "Wrap Up Your Troubles in Your Old Tool Box and Save, Save, Save". Both available from: IMS-Room 101 or IFAS Bldg. 116 University of Florida Gainesville, FL 32611 Have a residential architect or home building contractor speak to the class on construction factors to consider related to energy efficiency when building, remodeling or purchase a home. Arrange visit to one or more vacant homes (contact a realtor or builder). Inspect the home for energy efficient construction. Have the students evaluate their own home and another home and compare the two houses on energy efficiency factors. Use Handout: "Evaluation of Two Houses for Energy Efficiency". Discuss results in class.

UNIT: HOUSING

LOW ENERGY TECHNOLOGY
HOUSING AND HOME ENVIRONMENT

MODULE: MULTI-FAMILY HOMES

STUDENT PERFORMANCE OBJECTIVES	CONTENT	TEACHING-LEARNING ACTIVITIES
The student will be able to:		
1. List four energy related factors to consider in choosing an apartment or other multi-family unit.	Factors in considering energy efficient apartment. - Large windows or sliding glass doors facing south or north, preferably south. - A unit located in the center - i.e. a unit above and on each side is more energy efficient. - With individually metered apartments it is much easier to control energy costs. - Determine if there is adequate insulation.	Read: "Energy Saving Tips for Multi-family Housing Occupants". Collect pictures to illustrate apartments that are situated for energy efficiency and apartments not well situated. Develop a display. Visit an apartment complex. Use Handout "Apartment Complex Field Trip Guide" to study designated units. Develop a checklist to be used in viewing an apartment prior to renting. Using materials from Energy Usage Evaluation & Conservation unit, have students develop a list of energy saving techniques for apartment dwellers.
2. Assume the tenants of an apartment building paid all utility bills except for central heat and air conditioning (these costs are included in the rental price) list five methods you would expect tenants to use to save on energy.	Methods to save on energy 1. Reduce use of hot water 2. Turn off the lights 3. Cook-Bake with efficiency 4. Avoid over drying with clothes dryer 5. Do not leave refrigerator door open	Have students review energy saving check list in "Energy Saving Tips for Multi-family Housing Occupants. Check items they would expect tenants to use. Make a list of students' suggestions on chalkboard.

STUDENT PERFORMANCE OBJECTIVES	CONTENT	TEACHING-LEARNING ACTIVITIES
3. Now assume that the tenants pay all utilities, including heat and air conditioning, now list the five methods you would expect tenants to use to save on energy.	Methods to save on energy 1. Set thermostat at 80°F in summer 2. Set thermostat at 68°F in winter 3. Lower thermostat even more at night 4. Weatherstrip-caulk doors and windows 5. Reduce use of hot water	Have students review energy saving checklist a second time. Make a list of students' suggestions on chalkboard. Compare differences in the two lists. Ask question: If you owned an apartment building, would you want the units to be individually metered? Would you have individual heating and air conditioning units? Why? What would you prefer as a tenant in an apartment building? Why?

UNIT: HOUSING

LOW ENERGY TECHNOLOGY
HOUSING AND HOME ENVIRONMENT

MODULE: MOBILE HOMES

STUDENT PERFORMANCE OBJECTIVES	CONTENT	TEACHING-LEARNING ACTIVITIES
The student will be able to:		
1. List four energy related factors to consider in choosing the location for a mobile home.	Factors in locating mobile home - Long sides facing north and south. - Face kitchen east. - Windbreaks are needed along north and west sides. - Shade south side in summer. - Plant deciduous trees on the east, west and south sides of the home.	Read: "Energy Conservation in Your Mobile Home". Show transparency "Location and Orientation of a Mobile Home". Cut out shapes of trees, shrubs, walks, drives, etc. Locate on transparency. Visit a mobile home park as a class or individually. Use handout "Mobile Home Field Trip Guide" to study designated sites. Using models, develop a layout of a mobile home park to illustrate factors related to energy conservation. Collect pictures and develop a display of mobile homes showing energy efficiency.
2. List three methods for improving the energy efficiency of a mobile home	Methods of improving energy efficiency - Insulating the roof. - Weatherstripping and caulking windows and outside doors. - Light reflecting paint. - Skirting. - Storm windows.	Read: "Energy Conservation in Your Mobile Home". Visit a mobile home sales lot to view new and/or used homes for energy efficient features.

UNIT: HOUSING

MODULE: MOBILE HOMES

STUDENT PERFORMANCE OBJECTIVES	CONTENT	TEACHING-LEARNING ACTIVITIES
		Divide class into groups to investigate each method as to: a. procedure b. cost c. time involved d. practicality Collect examples of materials to be used in improving the energy efficiency of a mobile home.

BUILDING OR REMODELING TO SAVE ENERY

Florida Cooperative Extension Service
Institute of Food and Agricultural Sciences
University of Florida, Gainesville
John T. Woeste, Dean for Extension

Let's assume that sometime in the future you will remodel, build an addition to your home, or perhaps build a new home. In Florida, we use about 23 percent of our total energy consumption in the home, so each energy efficient home decreases the energy demand and contributes to total savings. In addition, energy conserving homes are more comfortable and economical for the occupants.

Here are some important energy saving ideas to consider before you start building or making changes in your house. The additional costs of adding energy efficient features may be wasted unless you plan effectively.

ORIENTATION

Orientation is the direction your home or new addition is situated in relation to compass directions in order to make the most effective use of the sun and wind.

In Florida, because of long periods of hot, humid weather, there is more to gain by orienting for summer cooling than for winter wind protection.

For best use of the sun for warmth in winter and coolness in summer, your home's main side and living areas should face south. The same is true for a new addition. Southern exposure provides better summer ventilation and more daylight is available when living areas face south.

The most troublesome orientation is toward the west. In summer, west walls and windows receive direct afternoon sun which increases the amount of heat gain when the house may already be overheated from a long, hot day. The summer sun cannot be controlled with overhangs on either the east or west walls. As the sun rises and sets, there is excessive heat gain during the warmer months.

If existing building codes or other regulations do not permit energy efficient orientation, then be sure and take advantage of other available energy conservation construction techniques.

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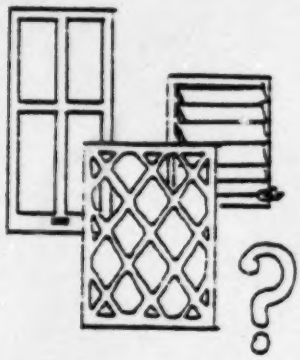
COOPERATIVE EXTENSION WORK IN AGRICULTURE AND HOME ECONOMICS, STATE OF FLORIDA, IFAS, UNIVERSITY OF FLORIDA, U.S. DEPARTMENT OF AGRICULTURE, AND BOARDS OF COUNTY COMMISSIONERS COOPERATING

WINDOWS

The window area of a typical home is about 15 percent of the floor area. This can be reduced under most building codes to 10 percent. When reducing window area, raise the sill height. This helps reduce heat gain in summer because the higher window is more easily shaded by roof overhang.



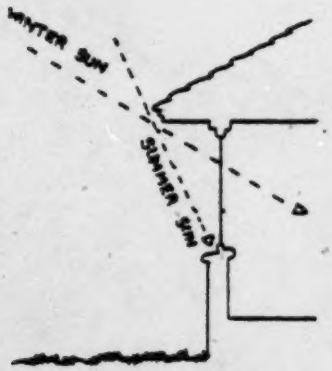
The size and shape of the windows will greatly affect the amount of energy needed to heat and cool your new home or addition. Windows that are larger than necessary increase cooling loads during warmer months.

Use good quality, well fitting windows with weatherstripping. Double glazing or insulating glass not only reduces heat loss but reduces air infiltration as well. However, double glazing may be too costly to be practical for south Florida homes.

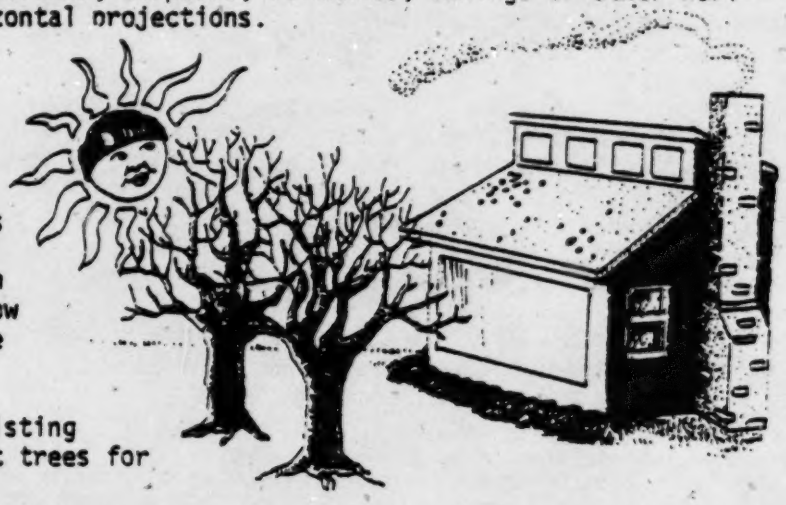
If you have a large east or west glass area which is impossible to shade, then use reflective coated glass or sun control films. This can cut up to 80 percent of the heat gain from the sun.

SHADING

Roof overhang is the most common method of architectural shading. A well designed overhang reduces heat from the summer sun and admits the winter sun. A horizontal extension of 30 inches, located 16 inches above the top of the window usually provides the desired sun exposure for a window 50 inches from sill to head. Full height windows or sliding glass doors will allow more sun to enter. Increasing the overhang will provide more shade.



If it is not possible to use roof overhangs for shading, then protect sunny windows and walls with porches, carports, balconies, awnings or other horizontal projections.

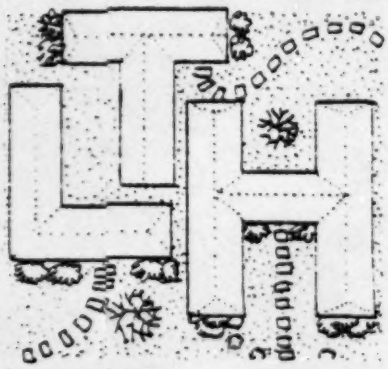


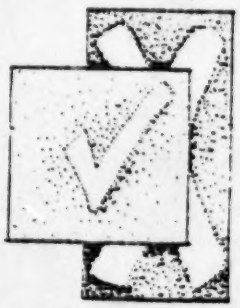
Another effective way to shade your home is the use of deciduous trees and vines. The foliage screens out the summer sun and the bare branches allow the sun's heat to warm the house in winter.

Take advantage of existing trees and select and plant trees for effective sun control.

HOUSE SHAPE

The shape of the house also affects the amount of energy necessary for heating and cooling. For example, although a square building has just as much interior living space as a rectangular space, the square building has less exterior wall area. For example, a 30' x 30' building has 900 square feet of interior space and 120 feet of exterior wall. A 20' x 45' building has 900 square feet of interior space and 130 feet of exterior wall. The less exterior wall area--the easier heating and cooling will be.





EASIER HEATING & COOLING IN SQUARE

Avoid the use of L -, T -, and H - shaped houses because these shapes increase the exterior wall area.

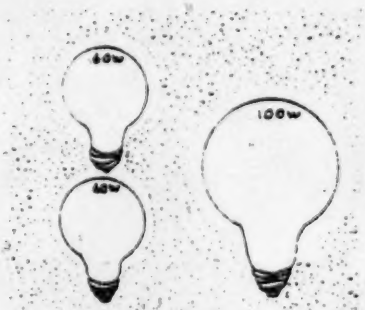
If possible, put your carport or attached garage on the east or west side to help reduce heat gain in the rest of the house.

LIGHTING

You can save a great deal of electrical energy with careful use of lighting. For example, if you have a switch beside each doorway, you can conveniently turn lights off when you leave the room. Also, install dimmer switches to control the amount of light you need in the room.

And did you know that fluorescent bulbs are up to five times more efficient users of electricity than incandescent bulbs? Can you think of some attractive ways you have seen fluorescent lighting used?

If you cannot use fluorescent lighting, use fewer but brighter incandescent bulbs. Lumens per watt are greater for higher wattage bulbs. You will get more light output (lumens per watt) from one 100-watt bulb than you will from two 60-watt bulbs.



MORE LIGHT FROM THE 100W BULB

OTHER DESIGN AND BUILDING TIPS

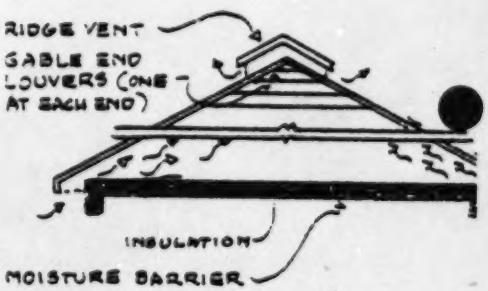
*Locate the air conditioning condenser where it will be shaded, particularly from the hot afternoon sun.

*Minimize air infiltration by using the most effective amount of insulation for your home and pay special attention to sealing cracks that can let air into the structure.

*Consider a heat pump if electricity is the source of energy. A heat pump may cost more initially but will cost less to operate. Sizing of heating and cooling equipment is important. Oversized equipment will operate for short periods of time resulting in poor comfort conditions, lower seasonal efficiency, and more energy use. Choose an air conditioner with a high Energy Efficiency Ratio (EER).

NOTE: The design and installation of heating and cooling systems should be done by competent, experienced personnel.

*Attic ventilation above insulation is necessary in both summer and winter. Natural ventilation using eave vents and gable vents or eave vents and ridge venting, should be 1 square foot for each 300 square feet of ceiling area. When you have ceiling insulation with an R-value of 19 or more, mechanical/electrical ventilation may use more energy than it saves.



*Even with a well insulated ceiling, use light-colored roofing material, since lighter colors reflect sunlight.

*Avoid running heating and cooling ducts through non-conditioned space. If this is not possible, then insulate the ducts with a duct wrap with an R-value of 4 to 8.

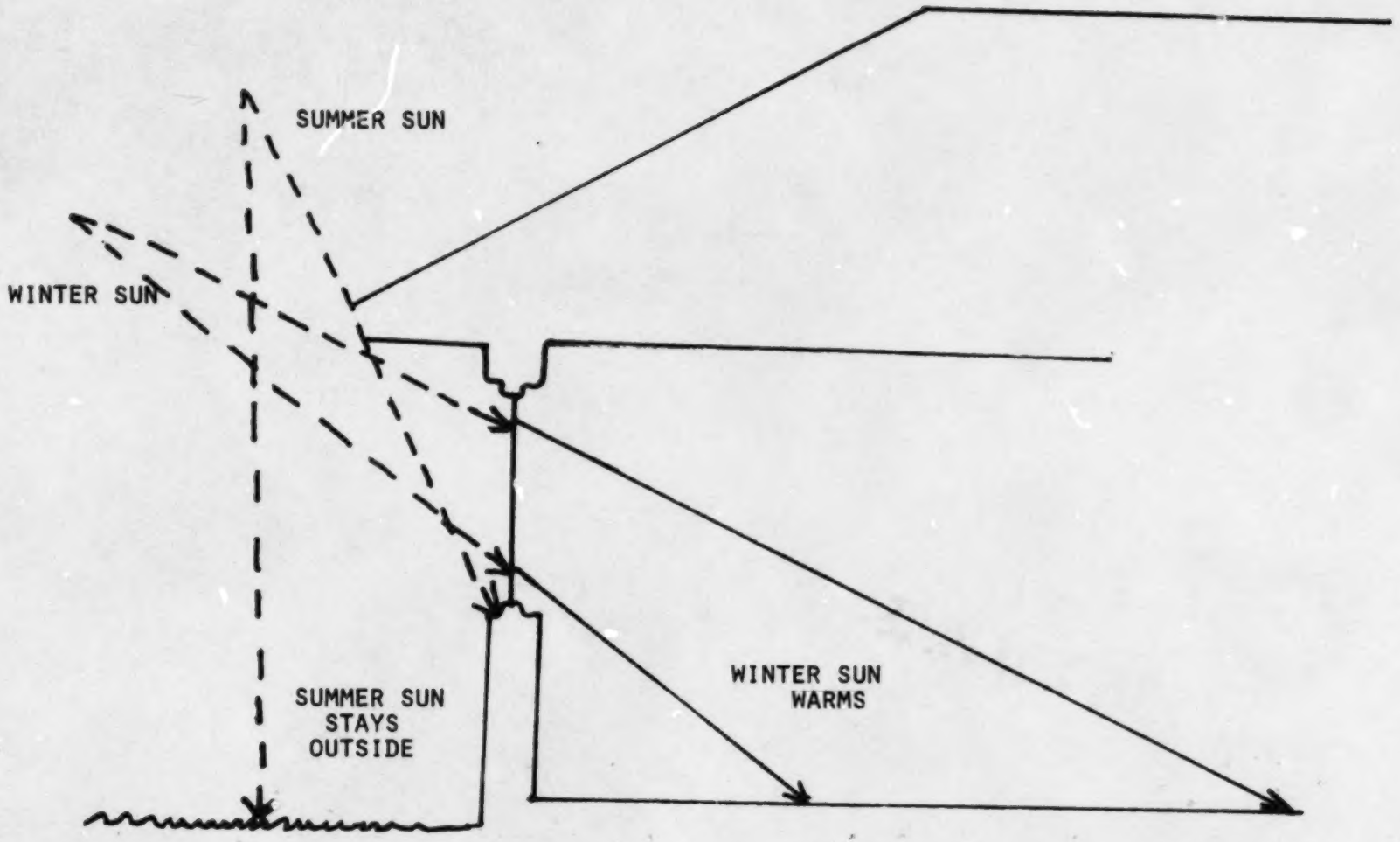
* * * * *

For more information about energy conservation, contact your County Extension agent.

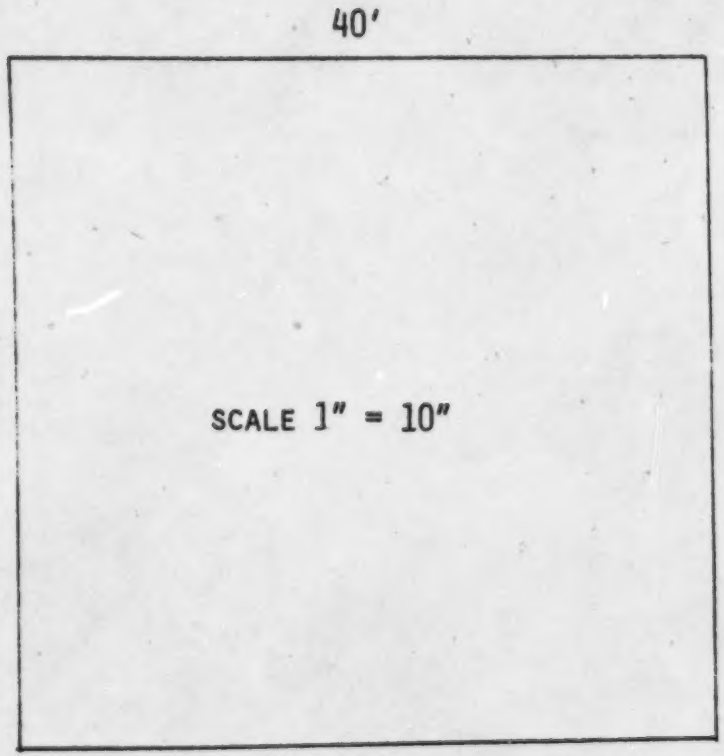
Prepared by: Faye T. Plowman
Associate Professor
Housing Specialist

Illustrated by: Kat Fitzpatrick

HOW AN OVERHANG SHADES A WINDOW



SHAPE OF HOUSE AFFECTS ENERGY USE



40' x 40' = 1600 SQUARE FEET

40' + 40' + 40' + 40' = 160 FEET EXTERIOR WALL

12

HANDOUT

LOCATION AND ORIENTATION OF HOUSES

HOUSE ADDRESS	DIRECTION HOUSE FACES	WINDOW AREA	WINDOW LOCATION-SHAPE	WINDOWS SHADED	HOUSE SHADED	WIND PROTECTION	LOCATION OF AC UNIT	HOUSE SCORE

DIRECTIONS: PUT SOME NOTES IN EACH BLANK TO HELP YOU REMEMBER THE HOUSE.
SCORE EACH HOUSE ON EACH OF THE SEVEN FACTORS

5-EXCELLENT 3-AVERAGE 1-POOR
4-VERY GOOD 2-FAIR 0-DO NOT KNOW

RANK THE HOUSES FROM BEST TO POOREST AS TO LOCATION & ORIENTATION
35 POINTS EXCELLENT (7 FACTORS X 5 POINTS EACH = 35 TOTAL POINTS)

Energy Information Fact Sheet
July 1980

Fuelwood and Fireplace Facts

Heating and Cooling With Less Energy

Faye T. Plowman*

Florida Cooperative Extension Service / Institute of Food and Agricultural Sciences / University of Florida / J. T. Woeste, Dean

INTRODUCTION

Heating and cooling accounts for about 40 percent of the energy consumed in Florida residences. Heating, however, consumes a much smaller part of the energy dollar than does air conditioning. In most air conditioned homes, more than half the electricity used during summer months is for air conditioning, due to the intense heat and humidity of a Florida summer.

HUMIDITY LEVEL AFFECTS COMFORT

Humidity levels affect the perceived temperature—high humidity makes our bodies hold heat, while dry air absorbs moisture from the skin, producing a chilling effect. High humidity, particularly in summer, is a problem in Florida, not only because it makes us feel warmer, but also because it supports the growth of mildew on furnishings, walls and clothing. While a low humidity level is not usually a problem in Florida, a long heating season may reduce the humidity level in the home. However, a higher humidity in the home in winter will help you be more comfortable with a lower temperature, thus saving energy.

HEATING AND COOLING OPTIONS

Size, efficiency and economy are factors to keep in mind when choosing a system to heat and cool your home.

Central systems heat and cool a whole house or apartment. They cost more to buy, install, and operate than room units but they provide uniform temperature distribution. Consider the installation of a zone heating and cooling system. This will permit the heating or cooling of specific rooms or areas in the home which are most frequently occupied. With a room air conditioner or heating unit, distribution of warm or cool air to adjacent rooms is poor.

To save energy and dollars, correct size and efficient operation are essential for any type of system. For example, when choosing an air conditioner, it is important to determine the amount of cooling capacity needed. Properly sized air conditioners can reduce humidity as well as cool the air. If the cooling capacity is too small, the air conditioner will not adequately cool and dehumidify your home. If the air conditioner is too large, it will be more expensive than necessary and will not dehumidify properly.

In order to compare different brands of equipment, check the manufacturer's information for the efficiency rating in terms of the Energy Efficiency Ratio (EER) or cooling efficiency and the Coefficient Of Performance (COP) or heating efficiency for heat pumps. These ratings tell you how much energy is produced by the system compared to the energy required to operate the system.

The higher the EER and COP, the greater the cooling and heating efficiency of the unit. An EER of 8 to 10 and a COP of 2.5 to 3.0 are considered energy efficient. Cooling and heating loads should be estimated by a qualified dealer or engineer who can advise you on the selection, installation and operation of the right equipment for your home and your individual situation.

Heat Pumps

Heat pumps come as package units that fit into a wall or window and as central systems. Central units are more expensive but more versatile than the smaller units since the air handling unit can be located anywhere in the home. The initial cost is usually more than other heating and cooling systems. However, in the heating mode, a heat pump costs less to operate than electric resistance heating. For more information about heat pumps, refer to EI-8, "Selecting a Heat Pump."

Room Air Conditioners

Room air conditioners come in various styles, depending on whether they are to be mounted in walls or sash or casement windows. Some models can be used for ventilating or heating as well as cooling and dehumidifying.

The cooling capacity of air conditioners is gen-

*This fact sheet was prepared by Faye T. Plowman, IFAS Associate Professor/Extension Housing Specialist. T. C. Skinner, P.E., IFAS Agricultural Engineering Professor Emeritus, acted as a consultant.

ASDF Corp. Model 5508A10

8,000 Btu per hour
(cooling capacity)

860 watts
115 volts 7.5 amperes

Data on this label for this unit certified by

energy guide

EER=9.3
Energy Efficiency Ratio expressed in Btu per watt-hour

For available 7,500 to 8,500 Btu per hour 115 volt window models the EER range is

EER 5.4 to EER 9.9

For information on cost of operation and selection of correct cooling capacity, write to National Bureau of Standards, 411.00, Washington, D.C. 20234.

IMPORTANT...
for units with the same cooling capacity, higher EER means:
Lower energy consumption
Lower cost to use!

Tested in accordance with

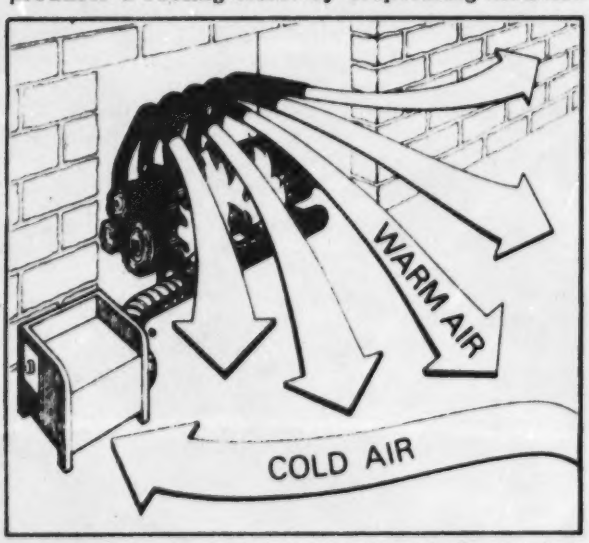
erally given in terms of BTU (British Thermal Units) per hour. A room air conditioner with a cooling capacity of 5000 BTU per hour will remove about 5000 BTU of heat hourly.

Compare the energy efficiency ratio (EER) label of several models. Air conditioners with the same cooling capacity (measured by BTU per hour) may vary greatly in efficiency. Energy guide labels can help you compare energy efficiency in various models. Again, air conditioners with higher EER ratings are more efficient than those with lower EER ratings.

Maintain the efficiency of your room air conditioner by reading and following the instructions in the owner's booklet that comes with it.

Fans

An alternative to consider when an air conditioner is not affordable or desirable is a ceiling, window or whole house fan. Air movement created by a fan produces a cooling effect by evaporating moisture from the skin, thus increasing comfort at a higher temperature. After the initial expenses of purchase and installation, fans will provide economical air movement because of the low wattage required for operation. Although less expensive to install and operate than an air conditioner, a fan will not be as effective in cooling and dehumidifying. Consult a qualified dealer for more information if you are considering the installation of a ceiling or whole house fan.



Conventional fireplace with heat-circulating unit (heater tubes).

SUPPLEMENTARY HEAT SOURCES

Decades ago, fireplaces and stoves were the main sources of heat in the home. With rising utility costs, they are regaining their popularity as supplementary heat sources.

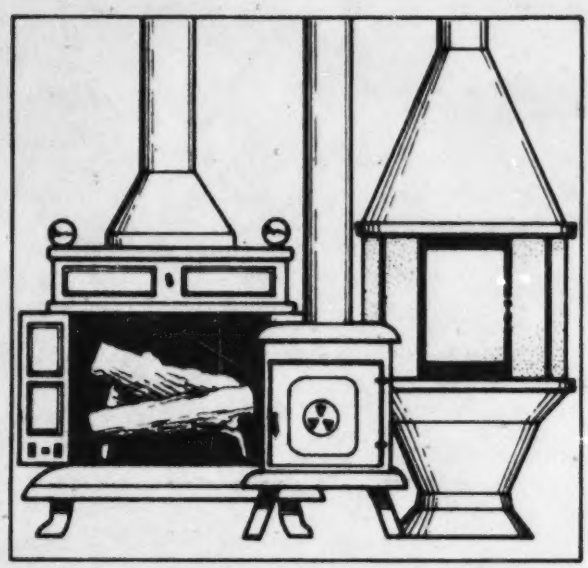
Fireplaces

Fireplaces as a heating source can be deceptive. When in use, a fireplace generates a large flow of air through the room and up the chimney. This means that although the fireplace is heating the immediate air, it is cooling the rest of the house by expelling warm air. For maximum energy savings while using a fireplace, close doors to the rest of the house or turn the thermostat down to keep the heating system from operating. When the fireplace is not in use, keep the damper tightly closed.

If you have a conventional fireplace, consider installing a glass door that closes off the fireplace when it is not in use to cut down on the loss of warm air up the chimney.

In new construction, use a "heat-circulating" fireplace which draws air for combustion from outside the house or draws warm air from the room, reheats it and returns it to the room.

There are units available which convert a conventional fireplace into a heat-circulating one. These units draw in cold room air which is circulated past the fire in a tube arrangement. The air is heated and warm air is then forced into the room. For greater efficiency, install a unit with a blower.



Many different models of wood stoves, varying in efficiency, are available.

Stoves

Before you purchase a wood burning stove, remember that wood has characteristics quite different from oil or gas. While oil and gas fuels burn slowly and evenly, wood burns in three distinct phases. First, moisture is evaporated. Next, the wood breaks down into charcoal, and finally the charcoal itself burns, producing the most heat. Various stove designs obtain the energy from burning wood in different ways. In general, a wood stove is hard to beat as a supplemental heat source.

Faulty installation of wood burning stoves is extremely dangerous; therefore a wood stove should be installed by a qualified dealer. If coal is to be used, a special stove is needed.

If you purchase a freestanding fireplace or stove, buy from a reputable dealer. Follow the manufacturer's maintenance instructions.

MAINTAINING YOUR HEATING AND COOLING EQUIPMENT

To get the most from your energy dollars, have your heating and cooling system serviced regularly.

Heating

Keep your heating system in good condition by having it checked before each season by your serviceman. Proper adjustment reduces fuel consumption. It is also important to check filters regularly and replace them as needed.

Repairing or replacing badly worn or outmoded equipment will also save money in the long run. When faced with major repairs or when buying new equipment, get several estimates (the larger the job, the more estimates). Your dealer and installer should study your home, measure the walls and windows, and give you written estimates.

Electric Resistance Heating. Very little maintenance is required for an electric resistance heating system. Check the manufacturer's recommendations.

Oil-fired Furnace. If you use an oil-fired furnace, follow this check list:

- Check all oil lines, connections and valves for leaks.
- Clean oil lines and filters.
- Be sure oil solenoid valve shuts off when burner shuts off.
- Keep soot and rust cleaned from the heat exchanger.
- Check chimney or exhaust stack for obstructions or exhaust gas flow.
- If there is a yellow flame at the burner or excess smoke from the chimney, the burner needs adjustment by a qualified serviceman.

Gas-fired Furnace. Use this check list if you have a gas-fired furnace:

- Remove rust and soot from the heat exchanger.
- Check air supply to obtain a clear blue flame.
- Leave the pilot lit all summer to reduce corrosion.
- Replace stacks with leaks.

Cooling Equipment

A dirty filter wastes energy, so clean or replace air filters every one or two months. Keep condenser coils clean and finned surfaces free from leaves and other foreign materials. Lubricate the bearing on the blower and adjust the tension of the fan belt at recommended intervals. Save, study and refer to instructions supplied by the manufacturer. If you have questions or need help with maintenance procedures, contact your serviceman.

A ceiling fan circulates air to create a cooling effect.

ENERGY-SAVING IDEAS

For both heating and cooling, you can conserve energy and money by using your system as little as possible. When the system is in use, make sure all windows and doors are closed tightly and that air outlets are not blocked by furniture or draperies. Heat or air condition only rooms that are most frequently used.

Cooling

- Set the thermostat no lower than 78-80° F.
- Raise the thermostat by 5° F. or turn off air conditioner if you are away from home for several hours. If you are away for an extended time period, install a time clock which operates the unit periodically to help prevent mildew.
- On sunny days, close the draperies, blinds, and shades to keep out sunlight.
- Install a whole-house ventilating fan in the attic to cool the house when the outside temperature is 82° F. or below. When windows are open, the fan pulls cool air through the house and exhausts warm air through the attic.
- Use a ceiling or window fan instead of an air conditioner.
- If draperies, outside awnings, or other methods of window covers are insufficient or not desirable, you may wish to install sun control film on the interior of windows which receive direct sunlight. This transparent polyester and aluminum film is relatively expensive and can cause a mirror effect. However, it stops much of the heat normally transmitted by the sun through windows. Because film application requires careful installation for best results, you may wish to have it installed by trained workers.

Heating

- Set the thermostat at 68° F. or lower during the day and at 55° F. during the night or while away from home for an extended time. NOTE: Some people require higher indoor temperatures. Follow your doctor's advice on thermostat settings if you have circulatory problems or if you have to take certain drugs which make you more sensitive to low temperatures.
- Keep the garage door closed if the garage is attached to the house.
- Close draperies, shades and blinds during the night and on cloudy days and open them on sunny days.
- Use plenty of blankets on you beds or use an electric blanket.
- Wear warm clothing.

Encourage your family to use the suggestions which are the most relevant to your housing situation and your life style.

Remember, in most of our homes, reducing the use of the heating and cooling system will have a significant effect on the energy dollar. Energy and utility costs can be saved by carefully selecting, maintaining and using this equipment.

For further information, contact your county Extension office. Refer to EI-9, "Saving Energy with Insulation", EI-10, "Weatherstripping and Caulking to Save Energy", and EI-17, "Landscaping to Conserve Energy".

Illustrations by Reed Pedlow

This public document was printed at a cost of $691.30, or 2.8 cents per copy, to inform the public with energy saving information. 8 - 25M - 80

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HANDOUT

EVALUATION OF TWO HOUSES FOR ENERGY EFFICIENCY

FACTORS TO CONSIDER	MY HOME	ANOTHER HOME
Orientation		
Shading		
Windows		
Doors		
Insulation ceiling walls floors		
Controlled Space for heating and cooling		
Lighting		
Major Electrical Appliances		
Ventilation of Attic		
Natural Ventilation		
Humidity Control		
Size & Efficiency of Heating Unit		
Location, Size & Efficiency of AC Unit		
Location, Size & Efficiency of Water Heater		

Inspect both homes, make comments on all factors to consider. Upon completion of the inspection, evaluate your findings and then indicate which home is most energy efficient and list your reasons for reaching this conclusion.

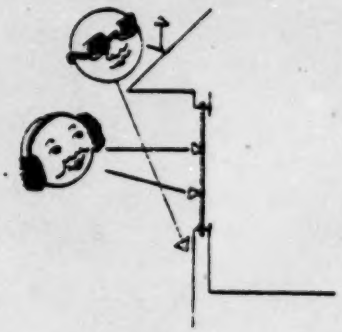
Energy Saving Tips For Multi-Family Housing Occupants

Florida Cooperative Extension Service
Institute of Food and Agricultural Sciences
University of Florida, Gainesville
John T. Woeste, Dean for Extension

Many people do not realize how simple it is to reduce their energy costs. If you live in a multifamily structure such as an apartment, condominium or townhouse, there are many things you can do to save money and energy, even though you will not be able to make structural changes.

Choosing the Location

To help keep cooling and heating costs to a minimum, choose a unit that has the large glass windows or sliding doors facing south or north, preferably south. In summer, the roof overhang should shade the window during the cooling season. In the winter, the roof overhang should allow the sunlight to enter during the heating season.



Avoid choosing a unit that has large windows facing east and west, particularly toward the west. East and west walls receive direct sun which increases the amount of heat gain, thereby increasing the cooling costs. Ask the management if they will install sun control film, especially on the west side. It will reduce about 80 percent of the heat gain from the sun.

If the unit is located in a multiple complex, choose an apartment that has a unit above it and one on each side. The other units will act as insulation for your place.

Ask if the building is insulated as many apartment buildings are not adequately insulated. Roof insulation is necessary to save fuel and can be a worthwhile investment for the apartment owner to save fuel costs. A building with an exposed attic and no insulation at all should definitely be insulated.

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COOPERATIVE EXTENSION WORK IN AGRICULTURE AND HOME ECONOMICS, STATE OF FLORIDA, IFAS, UNIVERSITY OF FLORIDA, U. S. DEPARTMENT OF AGRICULTURE, AND BOARDS OF COUNTY COMMISSIONERS COOPERATING

Does the apartment have a master meter with utilities included in the rent; or is the apartment individually metered? If you have an individual monthly bill, it is much easier to control your energy costs.

Management

Ask the management if they are actively committed to reducing energy costs. An apartment or a condominium association that has good maintenance practices can help you reduce your utility bills.

Ask for these maintenance checks:

_____Replace old showerheads with low-flow types.

_____Install low-flow aerators on kitchen faucets.

These two devices significantly reduce the flow of water from faucets and showers. As a result, they reduce your water bill and your utility bill for hot water.

CHECK LIST FOR YOU

After you have moved in, use the following checklist to help you evaluate your own energy use. The more you reduce your use of energy, the more you can control your utility bills.

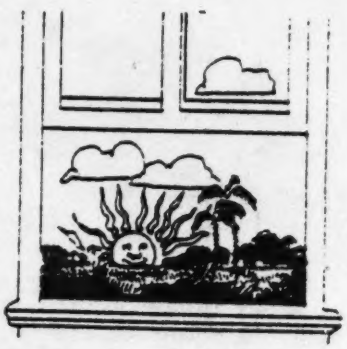
Control Indoor Temperatures

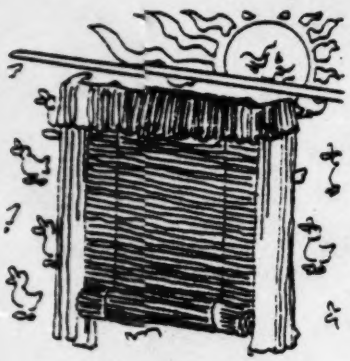
_____Reduce heating and cooling temperatures when away from home for long periods of time.

_____Increase temperature setting for summer air conditioning 78°F or higher.

_____Set air-conditioning unit to recirculate cool air instead of pulling in warmer outside air.

_____Use window fans for cooling during summer when outside temperature is below house temperature.





_____Open windows in evening or early morning.

_____Close windows during mid-day or afternoon.

_____Shade windows from direct sun in summer with draperies and roll-up shades.

_____Reduce daytime home heating temperatures in winter to 68°F or lower.

_____Reduce nighttime winter temperatures 5°F or more.

_____Open draperies and roll up shades to receive sun's heat in winter.

_____Open and close outside doors quickly when you enter or leave your apartment. It takes a lot of energy to heat or cool a building.

_____Use kitchen and bathroom exhaust fans only when necessary.

Use Your Equipment Wisely

Heating:

_____Reduce the amount of hot water used.

_____Take short showers instead of full tub baths.

_____Don't let the water run unnecessarily while you shave, brush your teeth, or wash your hair.

Dishwashing:

_____Accumulate dishes; hold until the dishwasher is filled. If dishes are hand washed, rinse and hold breakfast dishes until noon or evening.

_____Avoid wasting hot water by letting it run continuously while washing or rinsing dishes.

Laundry:

_____Wash only full loads of laundry.

_____Use cold water for rinsing clothes.

_____Use water no hotter than necessary for adequate soil removal and sanitation.

_____Use good laundry techniques to obtain satisfactory results in one washing process.

_____Avoid overdrying in the dryer.

_____Use the dry efficiently. Avoid drying one or two items at one time. Dry consecutive loads.

_____Remove items when dryer stops to avoid unnecessary wrinkling, which will require pressing to remove. Clean lint filter between each load.

_____Reduce ironing to a minimum by careful selection of garments and household linens.

Lighting:

_____Turn off unnecessary lights.

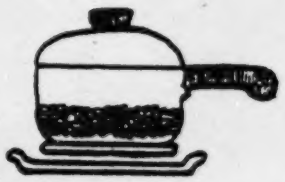
_____Reduce lighting levels to minimum for task to be performed.

_____Do tasks which require a high light level during the daylight hours when possible.

_____Keep lighting fixtures clean.

_____Use timers to turn lights on in the evening rather than leaving lights on all day when no one is home.

Cooking and Baking:



_____Use oven to capacity.

_____Use cooking utensils which fit the electric unit or gas burner.

_____Use tight-fitting lids on cooking utensils, when appropriate.

_____Reduce heat to maintain necessary cooking temperature when using surface units or burners.

_____Use small appliances for cooking, baking, and toasting. They are often more efficient than the range for small amounts of food.

_____Preheat oven only when necessary. Do not preheat longer than needed to attain required temperature.

_____Turn off oven, surface units, or burners promptly when food is cooked.

Refrigeration-Refrigerator and Freezer:

_____Avoid opening door or holding it open unnecessarily.

_____Keep grills and evaporator coils clean.

_____Defrost as needed.

Cleaning and Maintenance:

_____Empty or replace vacuum cleaner bag frequently to keep vacuum functioning efficiently.

_____Eliminate unnecessary vacuuming and floor polishing.

Recreation and Entertainment:

_____Turn off TV, radio, or stereo when no one is really watching or listening.

_____Disconnect an instant-on TV when you are not going to be using it regularly.

_____Develop leisure activities such as bicycling, hiking, reading, and swimming that have low energy costs.

_____Spend vacations closer to home.

_____Encourage at-home and neighborhood activities.

* * *

In addition to stimulating neighborhood activities, living in a multi-family housing complex has several other advantages.

They provide a good opportunity to save gasoline by car pooling or using mass transit.

Multi-family buildings are also more energy efficient than single family homes for the simple reason that there is less wall area exposed to the outside in attached dwellings like condominiums, townhouses and apartments.

* * *

Share your energy saving ideas.

The information in the "Checklist For You" is adapted from PA-118 "Energy Management Checklist for the Home", Glenda Pifer, Housing Specialist, USDA, 1975.

Prepared by: Faye T. Plowman, Associate Professor, Housing Specialist
Katey Walker, Assistant Professor, Family Resource Management Specialist
Kathleen E. Wood, Assistant Professor, Household Equipment Specialist

Illustrated by: Kat Fitzpatrick

HANDOUT

APARTMENT COMPLEX FIELD TRIP GUIDE

(Teacher should visit the site prior to the students and designate specific units to observe.)

Use the following checklist to evaluate the location and other characteristics of each unit.

UNIT #	Large windows or sliding glass doors facing south	Unit located in the center - vertically and horizontally	Individually metered	Roof overhang to allow sun for best advantage

Which unit would you choose? Why?

Energy Information Fact Sheet
March 1980

EI-11

Conserving Energy in Your Mobile Home

Conserving Energy In Your Mobile Home[1]

Faye T. Plowman*

Florida Cooperative Extension Service / Institute of Food and Agricultural Sciences / University of Florida / J. T. Woeste, Dean

We are becoming increasingly aware of the way rising costs and uncertain supplies of fuel affect our daily lives. One answer to the problem is an energy-conserving home. For the mobile home dweller, there are a number of special energy saving procedures. If you are now living in or considering living in a mobile home, this fact sheet will help you save energy, reduce your fuel bills, and still be comfortable.

The cost of operating your mobile home affects your budget. The comfort level affects your health. These are major considerations as you look for ways to save energy in heating and cooling.

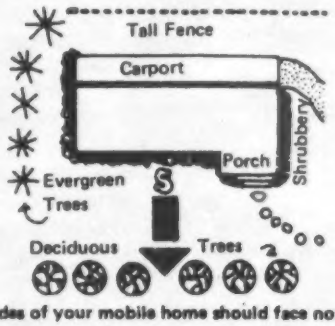
If your home was manufactured after mid-1976, look for a label permanently attached on an interior wall indicating that it was built according to Mobile Home Construction and Safety Standards issued by the U.S. Department of Housing and Urban Development (HUD), effective June 15, 1976. A mobile home built according to the HUD performance standards meets basic requirements for condensation control, air infiltration, and insulation in the ceiling, walls and floors. Some homes exceed minimum HUD performance standards for thermal protection and are labeled as "Energy Conserving Homes." If your mobile home was manufactured before June 1976, it was probably constructed according to the ANSI (American National Standards Institute) Standard A119.1. If you find nothing to indicate thermal protection, then weatherize the mobile home yourself.

LOCATION AND ORIENTATION

How your home is placed (oriented) on its site will affect your comfort and safety. First, take advantage of shade in summer and the sun's warmth in winter. Second, locate your home to protect it from strong winds.

1. Orient your home so that the long sides face north and south. Otherwise, the home will be warmed unevenly and heat coming through east and west windows will be a problem.
2. Shade the south side in summer by using awnings or porches.
3. Plant deciduous trees on the east, west and south sides of the home.
4. Windbreaks are most effective when located along north and west sides. Use something like:
   * a semi-enclosed carport
   * large evergreen shrubs
   * evergreen trees that hold their lower limbs
   * a tall fence

When the home is properly sited and placed on a firm foundation, make sure it is tied down according to approved anchoring specifications. Information about anchoring is available from dealers or installers. Failure to properly anchor your mobile home endangers the lives of family members and leaves the home vulnerable to high winds.



The long sides of your mobile home should face north and south.

INSULATION

First, insulate overhead, where the greatest heat loss occurs. Foam insulating materials are available which can be applied to the existing roof. These materials should be applied only by qualified persons as foam insulation may not adhere to some surfaces. The roof should then be top coated with a protective liquid glass sealer to prevent discoloration and deterioration.

Cooling comfort can also be increased through the use of a reflective roof coating. This thick fibrous substance contains aluminum particles that migrate to the surface as the coating dries.

*This fact sheet was prepared by Faye T. Plowman, IFAS Associate Professor/Extension Housing Specialist. T. C. Skinner, IFAS Agricultural Engineering Professor Emeritus, acted as a consultant.

[1] Portions were adapted from USDA Fact Sheet AFS-2-3-6, "Weatherize Your Mobile Home to Keep Costs Down, Comfort Up."

A thick coating is needed.

Second, install fiberglass batts beneath the floor. Buy batts with a vapor barrier and place the vapor barrier toward the inside of the home. Keep the batts in place by attaching chicken wire to the joists. Insulation with an R-value of R-9 to R-11 is recommended over unheated spaces.

WEATHERSTRIPPING AND CAULKING

Air leakage increases the cost of heating and cooling. And cracks and leaks also allow moisture to enter which can damage both the interior and exterior of your mobile home.

Weatherstrip around all windows and outside doors. Check the threshold of outside doors and replace if necessary. Wear sometimes causes cracks to develop.

Caulk all cracks and openings (no matter how small) around the moldings, joints, nails, splash panels, windows, top seams, doors, roof vents and wheel housings. Caulking compounds are made in a variety of colors to match the mobile home exterior. The best compounds remain elastic when dry. These can be applied with a caulking gun or a putty knife. For filling small openings and cracks, cut the consistency with paint thinner. Follow the instructions provided with the compound.

WINDOWS

You can add an extra degree of protection to windows simply by installing a layer of 4 to 6 mil polyethylene. Use pressure sensitive masking or duct tape to hold the plastic in place over the window. However, tape may be difficult to remove at the end of the season. Another alternative is to construct a plastic envelope that can be fitted over the screen.

SKIRTING

Proper skirting of your mobile home provides added insulation and helps reduce the cost of both heating and cooling. It keeps high winds from producing an uplift effect on the home that can be damaging and dangerous. Corrugated metal or plastic, as well as concrete blocks or brick, may be used for this purpose.

Temporary skirting with hay bales or bagged leaves causes problems, for these materials may shift accidentally and close up necessary vent spaces. They are also a fire hazard since they ignite easily. It is better to use a more permanent non-combustible material. If the home has an underfloor burner for heating air or water, be sure that openings are left in the skirting to supply adequate air for combustion.

About six 8 by 16-inch vents should be placed in the skirting to allow for ventilation. One on each end, two along the front, and two along the back will usually do an adequate job. One vent should be placed as near as possible to the air intake of the furnace. A panel should be installed to provide access to equipment underneath the mobile home. Exposed water pipes—especially hot water pipes—should be wrapped with pipe insulation that is fitted and taped carefully over the full length of the exposed pipe. Heating and cooling ducts under the floor should be insulated. Use a minimum R-4 special duct insulating blanket and tape it in place.

AIR CONDITIONING

If your mobile home is equipped with a central cooling system, set the thermostat no lower than 78°-80°F. Have it checked annually by your serviceman.

If you use a room air conditioning unit, be sure to choose one which is sized for the space to be cooled. A properly sized air conditioner cools, dehumidifies and provides comfort with greater efficiency.

Before buying a room air conditioner, check the Energy Efficiency Ratio (EER) found on the Energy Guide Labels. The higher the EER number, the more efficient the air conditioner and the less it costs to operate compared to units of similar cooling capacity. For room air conditioners, the EER ranges from about 4 to 12. An air conditioner with an EER of 10 will provide the same amount of cooling with half the electricity as one with an EER of 5. Very often, a unit with the highest EER rating will cost more to buy, but will save you money in the long run because it uses less electricity.

HEATING

Mobile home gas and oil heating systems should be equipped with automatic cut-off devices. For all types of heating systems, set your thermostat no higher than 65°-68°F. Be sure you do not block the furnace's fresh air intake, outside draft opening, or inside outlets. You should also follow carefully the lighting, operating and maintenance instructions supplied by the manufacturer.

An annual check by a qualified maintenance person will help keep your heating system operating at maximum efficiency.

This public document was printed at a cost of $310.30, or 1.2 cents per copy, to inform the public about energy conservation in mobile homes. 4 - 25M - 80

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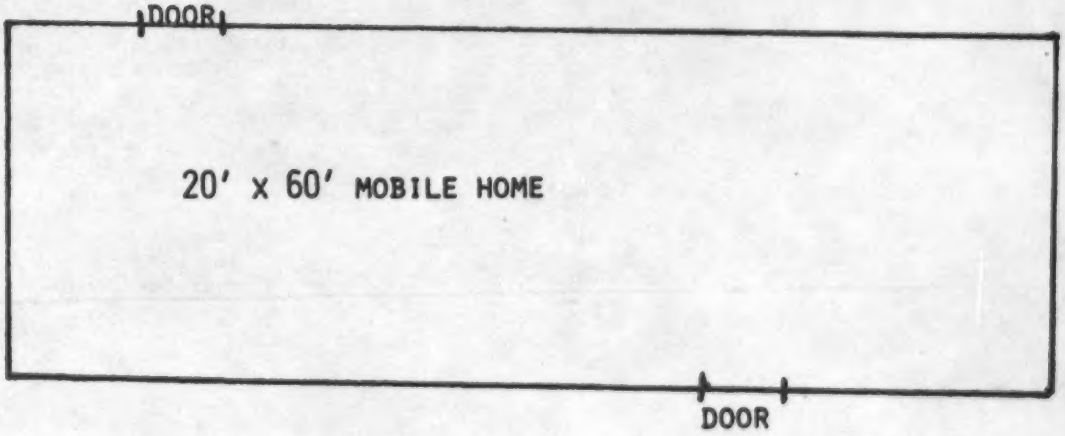
LOCATION AND ORIENTATION OF A MOBILE HOME



HANDOUT

MOBILE HOME FIELD TRIP GUIDE

Use the following checklist to evaluate the location and orientation of each home. (teacher should visit the site ahead of time and designate specific mobile homes to evaluate)

MOBILE HOME #	LONG SIDES FACE N.,& S.	WINDBREAKS ON N.,& W., SIDES	SOUTH SIDE SHADED	DECIDUOUS TREES ON E.,W.,& S., SIDES	INSULATION	WEATHER-STRIPPING CEILING	LIGHT REFLECTING PAINT	SHADE

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